Patent claims

1. Wireless communication device (MP) with reduced SAR value with at least one circuit board (LP) and with at least one antenna (AT1) coupled to it to emit and/or receive electromagnetic radio energy fields,
characterized in that,
at least one first additional, current-conducting corrective element (CE1) for SAR value reduction is coupled to the circuit board (LP) and is embodied such that the amplitude level (IM1, NIM1) and/or phase angle of electrical currents (I3, I1, 12) on the antenna (AT1), the circuit board (LP) and the corrective element (CE1) are adjusted in relation to each other, so that the maximum of the SAR distribution (S(X,Y)) which results overall as a result of these currents (I1, 12, I3) in the body tissue of a user when they carry the wireless communication device (MP) or bring the wireless communication device (MP) up to the area of their head to speak or to listen becomes minimal.

2. Wireless communication device in accordance with Claim 1,
characterized in that
to tune the phase angle and/or amplitude of the electrical current (12) on the first corrective element (CE1) and/or the circuit board (LP) additional tuning means (TE1) are provided such that the overlaid total current flow (RSV(X)) resulting from the electrical currents on there circuit board (LP), the corrective element and the antenna (AT1) has the overall effect of producing a largely homogeneous SAR distribution (S(X,Y,Z)) in a specifiable surface area (L • B) viewed from the side of the circuit board (LP) facing the user, or in a specifiable Volume area (VOL) around the coupling structure of the circuit board (LP) as

well as the antenna (AT1) coupled to it.

3. Wireless communication device in accordance with one of the Claims 1 or 2,
characterized in that,
at least a second, current-conducting corrective element (TE1) is provided as an additional means of tuning for tuning the current flow (12*(X)) on the first corrective element (CE1) and/or on the circuit board (LP) such that a changed electrical current flow (I2(X)) on the first and/or second corrective element (CE1, TE1) is caused which runs largely out-of-phase to the current flow (I1(X)) on the circuit board (LP), with, as a result of the overlaid total current flow (RSV(X)), on the circuit board (LP), the first and/or second corrective element (CE1, TE1) and also the antenna (AT1) taken together a largely homogeneous SAR distribution (S(X,Y,Z)) over the overall area (L•B) of the side of the circuit board (LP) facing the user, or in a specifiable volume area (VOL) around the coupling structure of circuit board (LP) as well as the antenna coupled to it (AT1) results.

4. Wireless communication device in accordance with one of the Claims 1 through 3,
characterized in that,
the first corrective element (CE1) is electrically connected to ground (ERD) of the circuit board (LP).

5. Wireless communication device in accordance with one of the Claims 1 through 3,
characterized in that,
the first corrective element (CE1) is coupled capacitively or inductively to the circuit board (LP).

6. Wireless communication device in accordance with one of the

Claims 3 through 5,
characterized in that,
the second corrective element (TE1) is electrically connected to the first corrective element (CE1) and/or to the circuit board (LP).

7. Wireless communication device in accordance with one of the Claims 3 through 5,
characterized in that,
The second corrective element (TE3) is capacitively and/or inductively coupled to the first corrective element (CE1) and/or to the circuit board (LP).

8. Wireless communication device in accordance with one of the Claims 3 through 7,
characterized in that,
the second corrective element (TE1) is and integral component of the first corrective element (CE1) and/or of the circuit board (LP).

9. Wireless communication device in accordance with one of the Claims 3 through 7, characterized in that,
the second corrective element (TE3) is provided separately from the first corrective element (CE3) and/or separately form the circuit board (LP).

10. Wireless communication device in accordance with one of the previous claims,
characterized in that,
the first corrective element (CE1) is embodied as a loop which partly or entirely essentially extends along the side edges (SRL, SRO, SRR, SRU) of the circuit board (LP).

11. Wireless communication device in accordance with Claim 10,
characterized in that,

the loop for the first corrective element (CE1) is essentially embodied as a rectangle.

12. Wireless communication device in accordance with one of the Claims 3 through 11,
characterized in that,
the second corrective element (TE1) is embodied as a serpentine loop structure or in the form of one or more flat elements (TE2).

13. Wireless communication device in accordance with one of the Claims 3 through 12,
characterized in that,
the first and/or the second corrective element (CE1, TE1) are each arranged at a specifiable height (HA) from the circuit board (LP).

14. Wireless communication device in accordance with Claim 13,
characterized in that,
the first and/or second corrective element (CE1, TE1) are arranged at a height (HA) of between 0,1 and 0. 6 cm away from the component placement surface of the circuit board (LP).

15. Wireless communication device in accordance with one of the Claims 3 through 14,
characterized in that,
the first and the second corrective element (CE1, TE1) are essentially positioned in the same layer plane.

16. Wireless communication device in accordance with one of the Claims 3 through 15,
characterized in that,
the second corrective element (TE4) is accommodated in a layer plane which is different to the layer plane of the

first corrective element (CE4)

17. Wireless communication device in accordance with one of the Claims 3 through 16,
characterized in that,
the second corrective element (TE3) is formed by an ESD protective element (ESD= electrostatic discharge), especially by a metallic display window.

18. Wireless communication device in accordance with one of the Claims 3 through 17,
characterized in that,
the second corrective element (TE1) runs essentially orthogonally to the longitudinal extent (L) of the first corrective element (CE1).

19. Wireless communication device in accordance with one of the Claims 3 through 18,
characterized in that,
the second corrective element (TE1) is positioned and dimensioned in such a way relative to the circuit board (LP), the antenna (AT1), and/or the first corrective element (CE1) that the minimum resulting SAR distribution is produced at around the resonant frequency in radio operation of the antenna (AT1) .

20. Wireless communication device in accordance with one of the Claims 3 through 19,
characterized in that,
the second corrective element (TE1) is dimensioned such that the component placement surface of the circuit board (LP) fictitiously enclosed by it corresponds at most to 0.2 to 0.5 times the part of the circuit board surface (LB) fictitiously enclosed by the first corrective element (CE1).

21. Wireless communication device in accordance with one of the previous claims,
characterized in that,
on there circuit board (LP) at least a third additional, current-conducting corrective element (ZV6) is coupled and embodied as a tuning means such that for an electrical current (I1) generated on the circuit board (LP) possibly by electromagnetic radio energy fields of the antenna (AT1), an explicit, fictitious current path extension is effected while simultaneously largely retaining the original specified length and width dimensions of the circuit board (LP).

22. Wireless communication device in accordance with Claim 21,
characterized in that,
the third corrective element (ZV6) in is located in the area of that end face of the circuit board (LP) which lies opposite the end face of the circuit board (LP) with the connection area of the antenna (AT1).

23. Wireless communication device in accordance with one of the Claims 21 or 22,
characterized in that,
the third corrective element (ZV6) is embodied in a serpentine shape.

24. Wireless communication device in accordance with one of the previous claims,
characterized in that,
the relevant additional corrective element (CE1, TE1) is assigned to that component placement surface of the circuit board (LP) which, when the wireless communication device is worn on the body and/or when the wireless communication device is brought up to the area of the relevant user's head for speaking or listening is facing this area.

25. Wireless communication device in accordance with one of the previous claims,
characterized in that,
the relevant corrective element (CE1, TE1) is arranged on the component side of the circuit board (LP) opposite the antenna (AT1).

26. Wireless communication device in accordance with one of the previous claims,
characterized in that,
the relevant additional corrective element (CE1, TE1) is positioned such that its imaginary orthogonal projection in relation to the component placement surface of the circuit board (LP) essentially lies with the delimitation area spanned by its side edges (SRL, SRR, SRO, SRU).

27. Wireless communication device in accordance with Claim 26,
characterized in that,
the relevant, additional corrective element (CE1, TE1) is assigned as at least one further layer in a spatial area within, and/or above, and/or below, and/or to the side of the delimitation area spanned by the side edges (SRL, SRR, SRO, SRU) of the circuit board (LP).

28. Wireless communication device in accordance with one of the previous claims,
characterized in that,
an electrically conductive material, dielectric material, and/or magnetically conductive material is used for the relevant corrective element (CE1) .

29. Wireless communication device in accordance with one of the previous claims,
characterized in that,
the relevant corrective element (CE1, TE1) is formed by one

or more wire-type components, at least a single or multilayer, electrically conductive foil, covering, and/or by some other type or linear or planar element.

30. Wireless communication device in accordance with one of the previous claims,
characterized in that,
at least one corrective element (CE1) is formed by least one coating layer in the lower and/or upper shell of the housing (GH) of the wireless communication device.

31. Wireless communication device in accordance with one of the previous claims,
characterized in that,
at least one corrective element (CE1) is manufactured in punch/bend technology and is arranged at a specifiable height (HA) above the component placement surface of the circuit board (LP).

32. Wireless communication device in accordance with one of the previous claims,
characterized in that,
the circuit board (LP) is essentially embodied in the shape of a rectangle.

33. Wireless communication device in accordance with one of the previous claims,
characterized in that,
the antenna (AT1) is embodied as an $\Lambda/4$ antenna or PIFA (Planar Inverted F)antenna which together with the circuit board (LP) forms a radiating dipole.

34. circuit board (LP) with at least one additional, SAR value-reducing corrective element for a wireless communication device in accordance with one of the previous claims.